67. A cellular X-ray grid as defined in claim 61 wherein said upper and lower surfaces covered with protective plates composed of X-ray material transmitting for long wave components of X-ray radiation.

68. A cellular X-ray grid as defined in claim 67 wherein said protective plates are connected with said upper surface and said lower surface of said grid.

69. A cellular X-ray grid as defined in claim 61 wherein said partitions between cells are extended perpendicularly to said upper and said lover surfaces and all have the same length.

70. A cellular grid as defined in claim 61 which has at least one side arranged parallel to said direction of said movement of said grid.

REMARKS

These remarks are made in support of the amended and newly submitted claims in light of the art that was previously cited and applied. The principle references were applied are Caldwell (US Patent 1,208,474), Millenaar (US Patent 2,336,026), Liebert et al. (US Patent 4,414,679) and the publication by O. Mattsson from "Acta Radiologica", 1955 Suppl. 120, pages 85- 153.

Following is respectfully submitted Applicant's response:

Regarding paragraph 3 page 2 Applicant has respectfully to note:

Under the objection of Examiner Applicant amended claims and took off diagonals of cells not parallel nor perpendicular to longitudinal side of the grid.

Applicant agrees with Examiner objection that is no teaching of how to fabricate a functional flat focused grid that may be moved in a direction parallel to longitudinal side of grid.

On this Examiner's objection and objection that during movement the flat focused grid will block all or almost all primary X-ray applicant has been respectfully submitted next calculations:

Mostly grids move onto distance from 5 to 10 mm to each side from central beam which is perpendicular from focal point to surface of grid.

As result of moving of central line of grid away from the central x-ray beam when

the grid moves appears the loosing of small part of primary radiation and as result the insignificant increasing of dose of radiation for patient. The maximum loosing of primary in the end positions of grids during their movement are understandable from following:

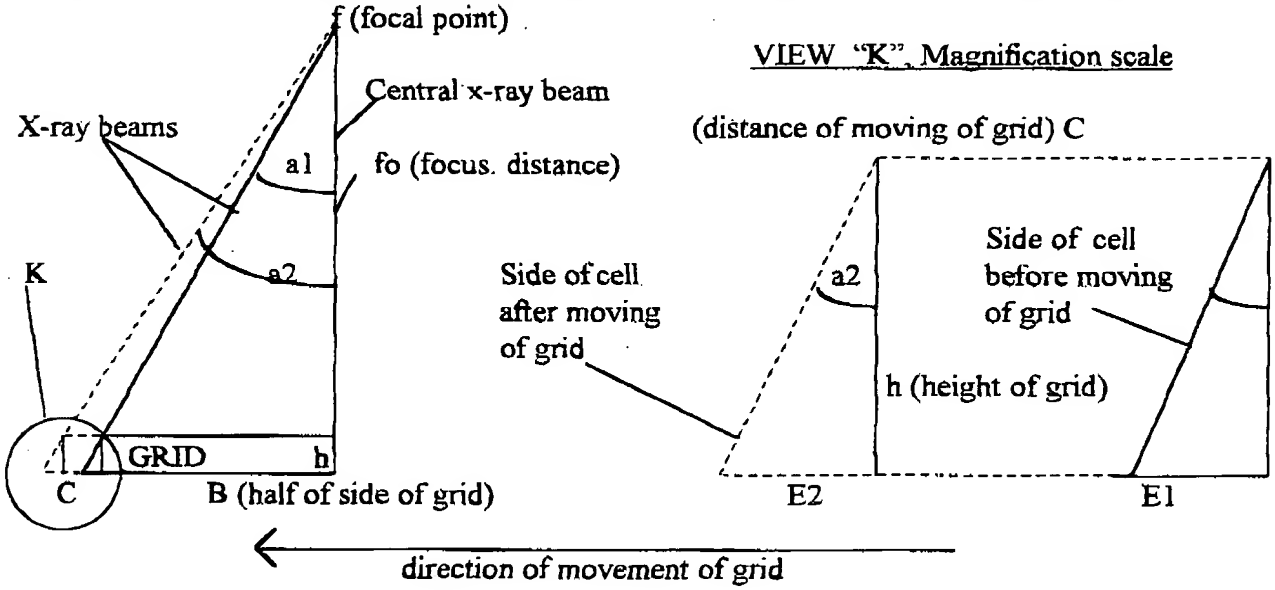

Fig.

On the drawing showed on the above Fig. the shadow from side of cell as result of movement of x-ray grid relative to X-ray beam is difference between lengths of sides -E2- and -E1- in triangles corresponding to height of grid -h-.

The height of grid -h- determines as product of grid ratio -r- by distance between sides of cell -D- :

$$h = r \times D \qquad (1)$$

The grid ratio -r- under the International Electrotechnical Commission (IEC) is given by:

$$r = \frac{h}{D} \qquad (2)$$

Sides E2 and E1 are proportional to tan a2 and tan a1 accordingly.

a1 is angle between central x-ray beam and x-ray beam which comes to the top apex of side of cell before movement of grid.

a2 is angle between central x-ray beam and x-ray beam which comes to same apex of cell after the movement of grid.

$$\tan a1 = \frac{B}{fo} \quad (3) \qquad \tan a2 = \frac{B + C}{fo} \quad (4)$$

Come to the basic numbers for General purpose Cellular Grid X-ray grid:
fo = 1000 mm, B = 250 mm (for side of grid about 500 mm), D=250 mk
The results after following computing:
tan a1 = .25, tan a2 = .255 for movement of grid 5 mm and .26 for movement of grid 10 mm.

Difference between tan a2 and tan a1 or in math writing (tan a1- tan a2) are .005 for moving of grid 5 mm and .01 for moving 10 mm.

The length of shadow from side of cell with x-ray beam in the end position of grid:

$$E2 - E1 = h \times (\tan a2 - \tan a1) \quad (5)$$

For grids with distance of movement C = 5 mm

for grid ratio r = 4:
E2- E1 = 1 mm x .005 = .005 mm = 5 mk
where 1 mm is height of grid h, (h for g. ratio 4 = r X D = .25 mm X 4 = 1 mm)

for grid ratio r = 12:
E2- E1 = 3 mm x .005 = .015 mm = 15 mk
where 3 mm is height of grid h, (h for g. ratio 12 = r X D = .25 mm X 12 = 3 mm)

For grids with distance of movement C = 10 mm

for grid ratio r = 4:
E2- E1 = 1 mm x .010 = .010 mm = 10 mk

for grid ratio r = 12:
E2- E1 = 3 mm x .010 = .030 mm = 30 mk

% of blocking of primary radiation -L- is given by:

$$L = \frac{E2 - E1}{D} \times 100\,\% \quad (6)$$

After the computing for end positions of grids (which are small component of dynamic positions of grid during it movement) the showed above trigonometry calculations give the result for the blocking of primary radiation from 2 % (for grids with ratio 4 and movement 5 mm) till 12 % (for grid with ratio 12 - max. ratio for cellular Grids and movement 10 mm).

Integrated loosing (or blocking) of primary radiation during the movement of grid defines by formula (7):

$$\text{\% of loosing (or blocking) of primary radiation : } \int_0^S \frac{dx}{x} \qquad (7)$$

where S is % of loosing of primary radiation on end positions of movable grid 5 and 10 mm from central beam computed above under (6).

Finally the computing of real number of loosing of primary radiation gives the result from .69 % for grids with ratio 4 and movement 5 mm (.197 in.) to 2.48 % for grids with ratio 12 and movement 10 mm (.394 in), there are very small numbers which show that practically loosing of primary radiation and following increasing of dose doesn't come with moving of grid during the X-ray procedure in today's technology.

Applicant has respectfully to note that all contemporary X-ray machines in the world for conventional medical x-ray technology are supplied by Bucky mechanisms for movement of grids in which using grids have been installed. Without these today's x-ray medical technology can't work.

Caldwell

Caldwell's reference discloses a **radially focused** **circular** **x-ray grid** that is composed of simple thin lead strips (lead is only soft x-ray absorbent but not construction material and it can't keep the configuration of strips), the strips on the side view are the parts of the radiuses from the focus of grid and they have the uniform length as result this grid cannot provide required sharpness of x-ray images, Caldwell's grid having cells for the transmission of the X-rays with sides oriented about 45 degrees to the direction of movement of grid which doesn't provide the erasement of images of cells on the mentioned x-ray images. Caldwell does not suggest like in current application or even imply the **hypotenusely oriented** **flat** **cellular grid** where on the side view the thin partitions (Caldwell calls them strips) between cells have the different length proportionally to hypotenuses oriented along them to the focus of grid which provide required sharpness of x-ray images, and sides of cells oriented on the plane view onto such angle to direction of movement of grid that completely eliminates the images of cells on the x-ray image, said partitions in current application are complicated and contain two components: inside part made from hard material which keeps the mechanical properties of partitions (and grid) and x-ray absorbing layer covering the surfaces of partitions for keeping of physical properties of partitions (and grid).

Mattsson

Mattsson describes the **cross, not cellular** grid, which contains sides of cross section intervals parallel or perpendicular to direction of movement of grids along the

patient body as provide by conventional x-ray machines. Mattsson proposed to move cross grid under the angles different from 45 degrees to patient body for erasement of image of cells. Such movement of grid under the angle to patient body will take grid from the patient and destroy the edges of x-ray image and requires redesign of conventional x-ray machines. Also Mattsson's movement wasn't proposed for cellular grid it was proposed for cross-section grid which has absolutely different design.

In opposite Applicant proposed for cellular grid to arrange the sides of it cells to direction of movement of grid under the Mattsson's angles which allows to use for cellular grids the conventional x-ray machines with movement of grid parallel to patient body, doesn't take grid from patient and doesn't make any damages for x-ray image.

Applicant has respectfully to note that his invention has much more scope that only Mattsson's angles and includes all angles of arrangement of sides of cells which guarantee the erasement of their images on the X-ray images, and there are much more angles, not Mattsson's only. In current application Mattson's angles are used only as sample with prior published mathematical support of some of angles for complete erasement of images of cells during the movement of grid.

Millenaar

The Office has previously cited Millenaar disclosing a cover for cellular grid. While Millenaar discloses a cover his linear grid, he does so in the context of the manufacture of a composite material from which an x-ray linear grid may be constructed. He does not teach or even suggest as the claim recite, that the cover designed to enclose layers of the grid material for the linear grid also could be use for covering of cellular grid especially for sealing of cells which contain gas or vacuum.

Liebert at all

Liebert represents the stationery non movable cellular grid which joint motionless with image receptor. Attempt to move such grid will have the result motion it together with image receptor (not move relatively to image receptor) and it will be no any erasement of images of cells on x-ray image onto receptor. This fixed design of grid-receptor system can't be used in practice of x-ray medical diagnostic because image of partitions between cells will be cause for loosing of 20-40 % of information from x-ray image about patient especially this loosing is too big for honeycomb and spiral design and make x-ray medical diagnostic impossible.

In opposite Applicant's cellular grid separated from x-ray receptor which have tetragonal cells with sides inclined under the specific angles guarantees total erasement of images of cells with minimum dose of radiation for patient and maximum medical diagnostic information.

In the claims

Applicant now address the amended and new claims, and offer remarks as to why these claims are distinguishable over the cited art.

Claims 46 through 60 are canceled.

Inserted new independent claim 61 for flat movable focused cellular grid with recitation of it movement as was agreed during the personal interview with Examiner at December 28, 98.

Claims 62 -70 are dependent from claim 61.

Applicant has also respectfully to note that his patent application for x-ray machine with cellular grid filed in 1995 doesn't contain claims with design of grid, it claims contain only design of x-ray machine with cellular grid, they are clearly distinguishable from claims of current application filed in 1993 and this distinguish also was agreed during the personal interview with Examiner at December 28,98.

Applicant again expressly acknowledges and thanks Examiner C. Church for the opportunity of a personal interview in December 28,1998 and now submits the claims that he believes are in condition for allowance and respectfully requests the same.

Respectfully submitted,

____

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I hereby certify that this correspondence and attached documents are being deposited with the United States Post Service as first class mail addressed to: Commissioner of Patents and Trademarks, Washington D.C. 20231 on this date

________________Date:______

Oleg Sokolov

Enclosures:

1. Response to Office Action at 09/29/98, 8 pages.
2. Check $ 55.00, Extension fee for 1 month.
3. Request for one-month extension time
4. Self addressed pre-paid Return Postcard.